DOCUMENT RESUME

ED 223 120 HE 015 206

AUTHOR Gregory, Michael S.
TITLE The Science-Humanities Program (NEXA) at San Francisco State University: The "Two Cultures" Reconsidered.
PUB DATE 80
NOTE 9p.
PUB TYPE Reports - Descriptive (141) -- Journal Articles (080)
JOURNAL CIT Leonardo; v13 p295-302 1980

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *College Faculty; Conferences; *Curriculum Development; Educational History; Educational Philosophy; Higher Education; *Humanities; *Interdisciplinary Approach; Interprofessional Relationship; *Sciences; Teacher Workshops; Team Teaching
IDENTIFIERS New Humanism; *NEXA Program; *San Francisco State University CA; Sociobiology

ABSTRACT

The origin of the Science-Humanities Program (NEXA) at San Francisco State University, California, is described. The overall goal of NEXA was to provide a model for reconciliation between the two cultures, science and humanities (philosophy, literature, history, and the arts). The first objective was to establish a sense of collegiality and common purpose among the faculty of these fields. A second objective was to derive its new curriculum. Beginning with a core of 10 courses, this curriculum has enlarged to 20 courses taught by humanist-scientist teams. These courses are designed to provide basic concepts, historical perspectives, and acquaintance with current issues involving mutually the sciences and the humanities. The NEXA curriculum may be used by students to satisfy general education and elective requirements or to serve as the basis of major or minor programs. Additionally, a special master's curriculum is available for qualified students. The third objective of NEXA was to offer public events of high interest that brought to focus concerns shared by humanists and scientists, and the fourth was to disseminate the idea of science-humanities cooperation throughout a 19-campus system by means of consultations, conferences, and workshops. A historical summary is presented of the so-called "two-cultures" dilemma, whose origins are traced to the 17th century and whose consequences for the 19th and 20th century experience are examined in detail. Specific attention is paid to the new field of sociobiology as an example of scientific reductionism. The present plight of the humanists, the role of logical positivism, and possible future alternatives for a rehumanized philosophy are also examined. Another area of concern is "the new humanities." (SW)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED223120

Leonardo, Vol. 13, pp. 295–302.
Pergamon Press, 1980. Printed in Great Britain.

THE SCIENCE–HUMANITIES PROGRAM (NEXA) AT SAN FRANCISCO STATE UNIVERSITY: THE 'TWO CULTURES' RECONSIDERED

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Michael S. Gregory

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Michael S. Gregory*

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

This document has been reproduced as received from the person or organization originating it.
Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

Abstract—*The author describes the origin of the NEXA Program at San Francisco State University in California. He discusses the function of the staff seminar, the formation of a new curriculum based upon cooperating teams of humanists and scientists, the planning and offering of public events that bring science and humanities to common focus and the dissemination of NEXA throughout a 19-campus system by means of consultations, conferences and workshops.*

His discussion continues with an historical summary of the so-called 'two-cultures' dilemma, whose origins are traced to the 17th century and whose consequences for the 19th- and 20th-century experience are examined in some detail. Specific attention is paid to the new field of socioecology as an example of scientific reductionism.

The present plight of the humanities is considered in terms of both neglect and abuse. The role of logical positivism as a failed bridge between science and humanities is examined, as are possible future alternatives for a rehumanized philosophy.

The author then considers 'the new humanities', defined as the study of human culture in both its major manifestations—scientific and humanistic—coequally, employing a convergent approach to determine the generic 'form' (in Henri Frankfort's sense) of Western civilization. He concludes with an invitation to professionals in many fields to join NEXA in this enterprise.

I. ORIGIN OF THE NEXA PROGRAM

In 1975, the National Endowment for the Humanities (NEH) awarded to San Francisco State University a development grant of $700,000 in outright funds, with an additional $300,000 to be made available through federal gifts-and-matching monies [1]. The purpose of this grant was to support the formation of a curriculum dealing with historical relationships and reciprocal influences between the sciences and the humanities. Originally called the Science-Humanities Convergence Program, this enterprise soon changed its name to NEXA (participle of the Latin verb *nectere*, meaning *to bind*). In the ensuing years, NEXA has accomplished four major objectives. Each of these needs to be understood in relationship to NEXA's general goal of providing a model for reconciliation between the 'two cultures', science and humanities. (The humanities here are taken to include philosophy, literature, history and the arts.)

*NEXA Program, San Francisco State University, 1600 Holloway Ave., San Francisco, CA 94132, U.S.A. (Received 10 Aug. 1979)

The first objective was to establish a sense of collegiality and common purpose among a faculty as diverse and divided by disciplinary walls as is any contemporary university. At San Francisco State, there had been an additional source of alienation, and that was the 1968–69 student–faculty strike, the longest in the nation's history. Even before the grant was awarded, NEXA established a weekly staff seminar that provided a setting for acquaintance, cooperation and intellectual debate among faculty members housed in various departments within the University. Beginning with ten members (five from science, five from humanities) and a little wine and cheese, the staff seminar has grown to a group of 40 members representing 15 departments.

II. NEXA CURRICULUM

NEXA's second objective was to derive its new curriculum. Beginning with a core of 10 courses, this curriculum now consists of 20 courses taught by humanist–scientist teams. These courses are designed to provide basic concepts, historical perspectives and acquaintance with current issues involving mutually the sciences and the humani-

ties. The NEXA curriculum may be used by students to satisfy general education and elective requirements or to serve as the basis of major or minor programs. Additionally, a special Master's curriculum is available for properly qualified students. During the planning semester, after the team has formulated the basic course plan, it is asked to lead a discussion of the staff seminar devoted to the structure and content of the course in relation to the NEXA program as a whole. A sub-group of the seminar is responsible for reviewing the entire program and for making suggestions about adding new courses and reshaping the curriculum to accommodate changing conditions or opportunities on the campus. Further, overall direction of the NEXA program is vested in a steering committee, which in turn reports to a group composed of school deans and officers of central administration. Finally, the steering committee consults twice each year with a citizen's advisory board, made up of prominent academics and community leaders.

III. NEXA SYMPOSIA

The third objective of NEXA was to offer public events of high interest that brought to focus concerns shared by humanists and scientists. The purpose of such events was, and is, two-fold: to draw attention to the purposes of NEXA and to demonstrate the usefulness and vitality of cooperative ventures of this kind. Since 1975, NEXA has produced over a dozen events, large and small. Three larger events drew national (even international) attention, and so far two have resulted in book publication. The first event was a symposium on the subject of Sociobiology: Implications for Human Studies. Held in June 1977, this two-day debate was scheduled to coincide with the Pacific Regional Meeting of the American Association for the Advancement of Science. A book of essays, prepared by NEXA and including chapters written by the participants, together with a foreword by Edward O. Wilson, was published in 1978 [2]. The second event, held in December 1977, was entitled Recombinant DNA: Public Policy at the Frontier of Knowledge and was sponsored by the California Council on the Humanities in Public Policy. This one-day debate brought together scientists, philosophers and writers, along with Public Health officials of the City of San Francisco and the State of California. This lively session was videotaped and resulted in the publication of a transcription of the proceedings [3]. The third event, Einstein's Century, occurred in March 1980. Philosophers, physicists, historians, astronomers, musicians, writers and the psychologist Erik Erikson joined NEXA in a two-day observance of the close of Albert Einstein's centennial year. Proceedings will be available by autumn 1980.

IV. DISSEMINATION OF NEXA

The fourth objective, which became feasible only after NEXA had demonstrated its effectiveness, was to disseminate the idea of science–humanities cooperation to other campuses. In 1978, NEXA received a grant from the Andrew W. Mellon Foundation in the amount of $155,000 for the purpose of disseminating NEXA [4] to California State University at Fresno and California State University at Bakersfield, each of which is now in the midst of a three-year project, under NEXA's direction, to derive a series of convergent courses designed to provide the nuclei of new curricula at these campuses.

Just as the parent NEXA program has now been institutionalized at San Francisco State, so the dissemination program has been adopted for participating support by the Chancellor of the California State University and Colleges (CSUC) system. Under the terms of the Mellon award, NEXA was originally to sponsor a small workshop in San Francisco for client institution faculty in the summer of 1979. During the previous spring, however, the Division of New Program Development and Evaluation of the CSUC Chanceilor's Office offered NEXA the opportunity of holding a statewide conference. Accordingly, from 18 to 20 June 1979 a NEXA/CSUC Dissemination Conference was held at Asilomar, in Pacific Grove, California. More than 70 persons, representing all 19 CSUC campuses, attended and participated in workshops on such subjects as: Human Behavior; Science and Humanities in the Twentieth Century; The Role of Science in the Study of History; and Science and the Psychology of Creativity. The overarching question—Why the Sciences and the Humanities Need Each Other—was the subject of a concluding panel discussion. Proceedings of this conference are available [5]. Further dissemination efforts are planned for 1980–81.

V. NEXA'S PRESENT STATUS AND PROSPECTS

During its developmental period, NEXA has been continually evaluated. The most searching and comprehensive assessment conducted to date, at NEXA's invitation, was a site visit in May 1978 by an evaluation team headed by J. B. Schneewind, Provost of Hunter College, New York City. The team's findings are summed up by the following passage from its Report: 'The program is of substantial value to the University faculty, and it could be expanded to include more members of the faculty. It provides an intellectual focus capable of drawing together persons with very different educations and concerns. It helps students who are interested in broad, less narrowly disciplinary approaches .... It has enhanced the prestige of the humanities within the University, and—especially through its symposia—has

helped to project beyond the campus an image of the University as a vibrant home of excitement and progress. It has stimulated curricular change in other areas and it promises to continue to serve this function' [6].

The four immediate objectives of NEXA have been accomplished—staff seminar, curriculum development, public events and program dissemination. In addition, NEXA became established as part of the regular University curriculum as of autumn 1979. A further development of NEXA, provisionally called 'Urban NEXA', is in prospect. This project would make available NEXA courses to an audience of nontraditional students at a location in central San Francisco. The courses would be specifically designed to provide a new approach to liberal education for persons already established in careers or returning for personal enrichment. Should this plan attract developmental support, 'Urban NEXA' would commence on a pilot basis in autumn 1980 [7].

VI. THE 'TWO CULTURES' IN HISTORICAL PERSPECTIVE

A.

Beyond these immediate objectives and prospects, however, lies a more general goal. So far, what NEXA has achieved is the cooperation of humanists and scientists in a shared educational enterprise. But that is only the first step. The next step is to investigate the possibility of revising and enlarging the mission of humanities in general—a substantially more difficult undertaking.

Robert L. Sinsheimer, then at the California Institute of Technology in Pasadena, has written of the need for humanistic perspectives in the training of scientists. (His article was reprinted in *Leonardo* [8].) Partly this need stems from the change 'in the self-image of the scientist himself—in his self-discovery' that he too is a citizen in a society shaped and often threatened by the technology his work produces [8, p. 60]. But more importantly, says Sinsheimer, this need arises from the fact that 'one can, for perhaps the first time, conceive the specific reality of the Faustian bargain—that science could indeed wholly innocently and inadvertently lead us into a deadly trap' [8, p. 59].

This is not the first appeal from a scientist to humanists, although it is eloquent and highly cogent. For the most part, these appeals have gone unheeded by humanists, and no reciprocal appeal to scientists has been made from the humanities. Those are both sad and dangerous realities in a world threatened by unspeakably destructive armaments based on knowledge derived from basic and applied scientific research.

B.

In the 17th century, Francis Bacon detected the mesmeric effects of doing science for its own sake, without reference to philosophic context. In *Idols of the Cave*, he wrote: 'Men become attached to certain particular sciences and speculations, either because they fancy themselves the authors and inventors thereof, or because they have bestowed the greatest pains upon them and become most habituated to them.' Moreover, Bacon warned, 'whatever [one's] mind seizes and dwells upon with peculiar satisfaction is to be held in suspicion . . . . [and] so much the more care is to be taken in dealing with such questions to keep the understanding even and clear' [9].

Also in the 17th century, when modern science began, poets experienced the influence of the new single-minded approach in the sciences and rebelled. T. S. Eliot, speaking of the decline of metaphysical poetry, said: 'A dissociation of sensibility set in, from which we have never recovered . . . . The poets revolted against the ratiocinative, the descriptive; they thought and felt by fits, unbalanced' [10].

The Cartesian dualisms of mind and body provided a philosophical warrant for the schism that was already well begun in the 17th century in Europe. According to Marjorie Hope Nicolson, the unity of experience under the Christian God was smashed during this fateful century. 'For three hundred years,' she said, 'men have vainly tried to put together the pieces of a broken circle . . . . Since the seventeenth century the paths of literature and science have divided, and the ways of one have become strange to the other . . . . The Circle of Perfection finally broke under the impact of seventeenth century science' [11].

The Circle of Perfection was a belief in the unity of God, nature and human beings. During the 17th and 18th centuries, the Circle was broken into three segments that almost, but not quite, touched each other. In these centuries one sees the beginnings of theology, humanism and science as separate disciplines, each with its own distinctive values and modes of thought. But not until the 19th century, with the precipitate decline of religious authority in the West (largely the result of Darwin's theory of evolution), do humans and nature stand in stark contrast to one another. What had once been understood as a single culture, and then three, became the 'two cultures', humanism and science.

In industrial societies during the 19th century, it seemed that science also provided the best guide for the conduct of human affairs. It was difficult to argue against 'progress' that brought both wealth and improvement in the conditions of daily life. In 1880, when Thomas Henry Huxley praised the foundation in England of Sir Josiah Mason's Scientific College, where the curriculum would be basic science and acquisition of technological skills, he was pleased to note that 'mere literary education and instruction' were to be excluded because they would lead, he said, only to 'the ordinary smattering of Latin and Greek' [12]. Further, said Huxley, 'the diffusion of thor-

ough scientific education is an absolutely essential condition of industrial progress ....' [12, p. 4]. Matthew Arnold, who was the indirect target of Huxley's remarks, could reply only lamely that 'there is ... really no question between Professor Huxley and me as to whether knowing the great results of the modern scientific study of nature is not required as part of our culture, as well as knowing the products of literature and art'. But he wished to reserve the study of science to those who have 'exceptional and overpowering aptitudes for the study of nature', who after all are not 'the great majority of mankind' [12, pp. 17, 23]. It was unfortunate for Arnold, and indeed for the course of the 'two-cultures' controversy, that he had forgotten Bacon's warning about 'whatever [one's] mind seizes and dwells upon with peculiar satisfaction is to be held in suspicion'.

C.

From the perspective of the 1970s, one may conclude that Huxley's joyful embrace of science and technology has turned out to be, as Sinsheimer recognizes, a Faustian bargain. It may be Faustian in two ways at once. First, humans have, of course, long been dependent upon technology. But since the industrial revolution, in return for broader material welfare, they have often suffered the loss of clean air and water, and the Faustian bargain now entails nuclear contamination, as well as industrial carcinogens in the environment and the food chain. And second, many persons have subtly abandoned a sense of themselves as free for a sense of themselves as bound by the same principles of mechanistic determinism that are the foundations of modern science.

In addition to Sinsheimer, two other scientists have lately commented upon the cost of the Faustian bargain. Lewis Thomas, author of *The Lives of a Cell*, says: 'One way of looking at nature is to put together all the facts learned thus far from the scientific revolution of this century, and to conclude that now is the time to make sense of this information. If you do this, you are likely to agree with the current view in highest fashion, that making sense of nature is really no great problem. In this view, the ultimate answer, if you're so naive as to go looking for ultimate answers, is that it simply makes no sense, no sense at all. [....] Genes are the ultimate competitors and the sole survivors; tiny mindless strands of polymer are at the center of life. Man's place in nature is absurd .... The central, essential, existential dogma is that the universe is an insensate contraption, and we are caught, trapped in it. In the circumstance, we have no responsibilities except to our individual selves, and to the genes that invent those selves' [13].

The reference to genes is taken from contemporary sociobiology, particularly the works of E. O. Wilson [14]. In discussing the propositions of genetic determinism of behavior, Gerald Holton sees sociobiology as an example of 20th-century scientific thought in general: 'Wilson's *Sociobiology* and related writings may be viewed as significant cultural artifacts in their own right, because they represent a world view characterizing this part of the twentieth century—for example, in their plea for a sophisticated form of flexible, almost stochastic, predeterminism and materialism; in their apparently dispassionate concern with a secularized ethic; in their accent on rationality and their underemphasis on affect and symbolic forms' [15].

Probably the most important scientific discoveries of the 20th-century are Neo-Darwinism (evolutionary theory plus Mendelian genetics), Relativity and Quantum Mechanics. Each of these represents an enormous step forward in understanding the structure of the living and nonliving worlds. But each of these also tends to influence one's view of oneself in relation to these worlds. The primary characteristics of this view I sum up as the hidden (and inner) costs of the Faustian compact: quantities rather than qualities; probability rather than principle; mechanism rather than existence; rational analysis rather than creative intuition; and, above all, predeterminism rather than free will.

D.

I believe that the humanities have suffered, during the past century, from both neglect and abuse. In large part, they have brought the neglect upon themselves, by refusing to become involved with the issues and discoveries of science. Among many humanists, it is almost fashionable to feign lack of interest in matters scientific, to regard subjects of scientific research as deadening to the best of human sensibilities. It is on the whole more likely that a scientist will know the author of 'Paradise Lost' than a humanist will know the discoverer of the Second Law of Thermodynamics. If neither knows, the humanist is probably less embarrassed by his ignorance. And I wonder why there has been little response by serious writers and poets to the enthralling prospects of space exploration, in comparison to the exuberance with which Elizabethan writers reacted to the voyages of Drake and his comrades. History may well note the eerie absence of response to the exploration of space as one of the oddest phenomena of this period.

The abuse suffered by humanists during the past century is both undeserved and merited. In an age of technological careerism, education has increasingly given way to training. Liberal education in the U.S.A. is maintained as an ideal, but in practice it survives mainly as 'breadth requirements' that, as students know, are to be gotten through as painlessly as possible. Rather than 'the ordinary smattering of Latin and Greek', today's students are fortunate if they have gained a

smattering of correct English before they graduate from a university in the U.S.A.

The emphasis on 'the world of work' in higher education is at first glance laudable; at closer view—deplorable. 'The world of work' is a cover term for catering to the marketplace, and even the fact that universities are notoriously inept at predicting employment trends does not prevent them from curriculum-mongering and making promises that almost certainly cannot be fulfilled. In all this cheapening of education and trivialization of information, it is of course the humanities that are most sorely abused, since they stand at the end of the line leading to the jobs touted.

If this abuse of the humanities is undeserved, there is another abuse for which humanists are responsible. Assaulted from without for 100 years, humanists have allowed the base of the humanities to be undermined for half that period. I refer to the dominion of logical positivism over classical philosophies. Beginning in 1910, logical positivists attempted to transform philosophy into science, and, in doing so, they tried to overthrow more than 2000 years of western philosophical tradition.

Beginning with the *Principia Mathematica* of Bertrand Russell and Alfred North Whitehead, in which it was argued that mathematics is the only medium capable of expressing exact ideas, and brought to nearly final form by Ludwig Wittgenstein, who advocated the formal analysis of linguistic propositions, logical positivism turned philosophy inward upon itself. No longer was philosophy the tool of speculation about the place of humans in the universe. Instead, logical positivists took on the function of watchdogs for scientists, warning them of the approach of unverifiable hypotheses and propositions. Indeed, it was Wittgenstein who held that questions incapable of provable answers should not be asked. Under the influence of logical positivists, philosophers no longer engaged in pioneering exploration. Rather, they undertook a repetitive checking of the maps of knowledge offered by other, more daring, practitioners.

When philosophers of the classical tradition defected to science, they deprived the humanities of leadership, theoretical exploration and intellectual authenticity. Fiction, for example, is typically preoccupied with the questions of life and death, the meaning of existence; some writers, like Joseph Conrad, are also concerned with the characteristics of the cosmos itself. Issues such as these were central to classical philosophy, which usually led literature and the other arts in engaging with them. But under the terms of logical positivism, these questions were ruled out as incapable of verification, therefore invalid. In the humanities, the effect was to drive the attention of many artists and writers away from the general and the public and toward the particular and the private. For most of this century, therefore, some of the finest practitioners of the humanities have been discouraged from performing what Matthew Arnold called 'criticism of life' [16]. Almost by definition, serious humanists can expect no more than a small professional audience, and their influence upon general culture has been steadily diminishing. At the same time, the authority of science has been approaching the status of dogma, at least for many of the general public.

E.

In the European Middle Ages, philosophy was divided into three branches: natural, moral and metaphysical. Natural philosophy was the branch that flourished, becoming in fact modern science. The moral and metaphysical branches, drained of vitality by the rapid growth of natural philosophy, have withered almost to the point of extinction. There is some recent indication, however, that the balance is on the way to being restored. Moral philosophy is being revived in the form of concern for ethical conduct in the performance of science and technology. Similarly, there is some renewed interest in metaphysical philosophy, which traditionally dealt with the characteristics of reality and the most general questions of existence.

In a recent interview, the philosopher and comparative religionist Jacob Needleman has said: 'So many students come to philosophy because they have some aching questions about their lives or values. Many of them get disillusioned and disgusted with academic philosophy and come away bitterly disappointed .... The gut-level questions that people ask themselves at three o'clock in the morning; that was and still should be the role of philosophy—to help people do justice to the problems of living' [17].

The indications are that, if the humanities are to survive, a way must be found for them to become the *new* humanities. Those in the humanities must regain both their grip on the world and their former appeal to imagination, intuition and human feeling. The time is certainly right. The authority of science as the supreme mode of comprehending the universe has been put in doubt for many persons by conspicuously irresponsible misuses of technology. The rise of irrational and occasionally insane cults may signal a starving human need for a more comprehensible and predictable order of experience than that which is made available by science. Above all, I believe there is a lack of unifying ideas about the human condition and the place of human beings within a universe that even Einstein found increasingly bewildering. Thus there is a need of a new humanities that will neither reject nor become bond servant to the sciences, but will restore to balance the coequal notions of *Homo sapiens* and *Homo faber*.

F.

In the NEXA program we have taken a very small

first step towards restoring this balance. Our curriculum is founded upon the assumption that humanities and science are complementary modes of knowing, although the objects of knowledge have become increasingly divergent since the 17th century. We do not believe that human beings have undergone cognitive speciation or that human brains are capable of deriving epistemologies and value systems that are in any final sense mutually unintelligible. Since Western humanities and modern science stem from a single developing civilization, we can assume that C. P. Snow's 'Two Cultures' is no more than a metaphor for dialectal differences within a single tradition of thought. That is not to say that it is not difficult to learn to recombine them. But we in NEXA are learning, and we hope we have the help of a powerful idea.

That idea, ironically, derives from one of the founders of logical positivism, Alfred North Whitehead. But Whitehead and Russell would probably not be content with logical positivism, especially in its contemporary form of logical empiricism. Both were given to speculations on the meaning of existence in precisely the sense ruled out by Wittgenstein. Here is Whitehead's idea, published some 20 years after the *Principia Mathematica*: 'In each age of the world distinguished by high activity, there will be found at its culmination, and among the agencies leading to that culmination, some profound cosmological outlook, implicitly accepted, impressing its own type on the current springs of action. This ultimate cosmology is only partly expressed, and the details of such expression issue into derivative specialized questions of violent controversy. The intellectual strife of an age is mainly concerned with these latter questions of secondary generality that conceal an agreement upon first principles almost too obvious to need expression, and almost too general to be capable of expression. In each period there is a general form of the forms of thought; and, like the air we breathe, such a form is so translucent, and so pervading, and so seemingly necessary, that only by extreme effort can we become aware of it' [18].

Whitehead's idea of *the general form of the forms of thought* had little effect upon philosophy, probably because it became confused with the 'world view' of the romantic period. But it had, at least for a time, considerable impact upon linguistics and anthropology. The alternative expressions, 'unconscious system of meanings' (Edward Sapir), 'unconscious canons of choice' (Ruth Benedict) and 'world view' (in the special sense employed by Robert Redfield), are all cross-cultural applications of Whitehead's basic idea about cognitive epochs within a single culture.

In NEXA, we presuppose, along with Whitehead, that the forms of thought issue from a *general form* of the forms and that the latter is anterior to the former. Thus, in a given age science and humanities are forms of thought, and they may, and often do, 'issue into derivative specialized questions of violent controversy'. But the object of our discussions among ourselves and with our students is the shared condition from which such questions arise and that makes controversy between them possible. For example, in the early years of this century the controversy between the Darwinian determinists (including Marxists) and the vitalists, such as Butler, Wells and Shaw, centered upon the role of the human being in the universe, not on the characteristics of the universe itself. The prior and silent agreement that made this controversy both conceivable and acrimonious was that the universe is insensate and mechanical. That was accepted as a given among antagonists who were united by their disbelief in traditional religion [19]. What they actually debated was the question of whether or not mankind stands *outside* a mechanistic nature.

G.

A current object of the NEXA discussions is the remarkable shift of vision that occurred in a variety of fields during the years immediately following the turn of this century. One of our teams is on the track of the 'something' that happened to make important and nearly simultaneous leaps in the development of the natural sciences and of the arts. Such quests, characteristic chiefly of our courses on the Copernican, Newtonian, Darwinian, Einsteinian and Freudian 'revolutions', have generated a good deal of excitement among instructors and students, but they are far from complete. We do know, however, that we are in the presence of large, culture-wide shifts of value.

There has been much said recently about the necessity of reviving the study of values. At present, the term *value* means almost anything and, therefore, nearly nothing. For example, I have heard the absence of blue-green algae in drinking water called a value. But this is hardly a value in anything but a trivial sense. A sound anthropological approach to comparative value orientations can be found in Ref. 20, which I shall summarize here. Value orientations are in effect traditionalized decisions about fundamental questions, such as *human nature* (good, evil, perfectible, lapsarian); *nature* (benign, hostile, capable of propitiation, indifferent); *relation to nature* (harmonious participation, subservience, mastery); *time* (locus of value in past, present or future); and *conation* (the value and consequences of human action). Value orientations are specific to particular cultures, and the pattern that they constitute is identical to what Whitehead termed the general form of forms of thought. Indeed, one may consider value orientations as the structure of the general form of the forms of thought. Values in the ordinary sense are then the 'derivative specialized questions', the forms of thought, that are

not only available to conscious awareness, but on occasion 'issue into . . . violent controversy'. But the unique and enduring character of a culture derives from its constellation of value orientations. This constellation is what Whitehead termed the culture's 'ultimate cosmology', its particular and pervasive sense of order and meaning in the world.

The specialness of this cosmology is evident only from the outside—from the vantage either of another culture or of historical distance within one culture. The latter vantage is the one we have attempted to attain in NEXA. Our task might be termed that of undertaking cross-cultural comparisons within a single tradition, as Henri Frankfort undertook to do in his *Birth of Civilization in the Near East* [21].

In NEXA we are certainly not attempting to reconstruct the history of civilization in the Occident. But we do seek to discover two aspects of the development of this tradition. First, we are trying to determine the specific agreements and controversies between science and the humanities at crucial historical junctures. Second, we are trying to understand the shared cultural contexts that lead to and shape these specific agreements or controversies.

During the five years of NEXA's existence, we have made substantial progress on the former of these questions, but we have scarcely begun on the latter. During the years 1979–81, we have begun a fairly systematic assessment of value orientations within each of the periods covered by our curriculum (Greco-Roman, Renaissance, 16th through 20th centuries). The materials for this assessment are provided by synchronic cross sections of cosmology, religion, science, the arts, philosophy, and eventually (as Frankfort suggests) politics, law and moral systems. We emphasize that this is no more than a pilot study. But in an attempt to broaden the scope of this investigation and to gain the cooperation of other scholars, we expect to establish a journal devoted to the thrust of this research [22].

While it is certainly beyond the capabilities and resources of a single faculty (and perhaps even of an entire generation of faculties) to accomplish, the ultimate task is to derive the essential character, the 'form' in Frankfort's sense, of Western tradition. NEXA will be attempting, however, to take a preliminary shortcut. On the premise that one gains a sharper impression of the particularity (even the arbitrariness) of one's own culture by viewing it in contrast to another, we are planning a symposium that will center on the impact of Western technology on Chinese culture in the 19th and 20th centuries. The function of technology can properly be understood only by reference to the culture in which it is used, and this cross-cultural discussion should provide important insights into the alterations of traditional Chinese values that accompanied technology transfer from the West.

H.

In NEXA, we believe we are indeed pioneering a new humanities. It is new in the special sense that we assume the sciences and the humanities to be coequal expressions of the human mind, and therefore they deserve to be coequally understood and celebrated as aspects of total human achievement.

It is also new in the general sense that we view the humanities and the sciences within Western tradition as branches of a single tree, nourished by roots so ancient and so deep that one is no longer aware of them. Our final object of study, therefore, is this tree itself. As one moves downward, in reverse developmental time, from branch to limb to trunk, one discovers the confluences of structure and vitality, the wholeness-in-complexity, that have given the tree its uniqueness and intrinsic character. Ultimately, and with much help, we hope to discover the roots of this tree, which have made it not only distinctive but enduring. Perhaps when we have discovered these roots, we will have discovered more than the characteristics of the tree itself. Perhaps we will have a little light on why Western tradition survives, while other traditions—Indus, Mayan, Babylonian—have succumbed and vanished, leaving little more than legends that they once existed on the Earth.

REFERENCES AND NOTES

1. The maximum award for NEH development grants was subsequently reduced to $500,000 in outright, plus $200,000 in gifts-and-matching, funds
2. M. S. Gregory, A. Silvers and D. Sutch, eds., *Sociobiology and Human Nature* (San Francisco: Jossey-Bass, 1978).
3. *The Proceedings of the San Francisco State University Colloquium on Recombinant DNA* (Berkeley: The Blue Wind Press, 1978). Copies may be obtained at cost from the NEXA Program, School of Humanities, San Francisco State University, 1600 Holoway Ave., San Francisco, CA 94132.
4. Under the terms of the federal gifts-and-matching provision, $150,000 of this amount was matched by the National Endowment for the Humanities, bringing NEXA's total grant from NEH to $1,000,000.
5. Copies may be had at cost by writing to NEXA at the address given in Ref. 3.
6. J. B. Schneewind, R. L. Sinsheimer and J. E. McGuire, *Report of Site Visitors to NEXA Program, San Francisco State University, Spring 1978* (mimeographed). Copies available at cost.
7. NEXA has applied for an additional NEH grant, in the Higher Education Projects category, to fund this effort, which would also involve dissemination of the NEXA/Urban NEXA complex to interested institutions throughout the U.S.A.
8. R. L. Sinsheimer, Humanism and Science, *Leonardo* **10**, 59 (1977).
9. Quoted in On Breadth, Depth, Intuition and Judgement by L. S. Lerner, which appears in proceedings of the NEXA/CSUC Dissemination Conference [5]. I am indebted to professor Lerner for reminding me of this part of Bacon's *Idols of the Cave*.
10. T. S. Eliot, The Metaphysical Poets, *The Selected Essays of T. S. Eliot* (New York: Harcourt, Brace, 1932) pp. 247, 248.

11. M. H. Nicolson, *The Breaking of the Circle* (New York: Columbia Univ. Press, 1960). Included in *Science and Literature*, J. J. Cadden and P. R. Brostowin, eds. (Boston: D.C. Heath, 1964) pp. 79, 81.
12. T. H. Huxley, *Science and Culture and Other Essays* (1881), in Cadden and Brostowin, Ref. 11, p. 11.
13. L. Thomas, The Strangeness of Nature, *New England J. Medicine* **298,** 1454 (29 June, 1978).
14. An extreme statement of genetic reductionism is that of Richard Dawkins, *The Selfish Gene* (New York and Oxford: Oxford Univ. Press, 1976).
15. G. Holton, The New Synthesis?, in Ref. 2, p. 79.
16. In Cadden and Brostowin, Ref. 11, p. 22.
17. *San Francisco Chronicle* (22 June 1979) p. 18.
18. A. N. Whitehead, *Adventures of Ideas* (New York: MacMillan, 1933); republished as a Mentor Book (New York: The New American Library of World Literature, 1955) pp. 19–20.
19. Butler in later life reverted to the religion of his youth; combining a eulogy for Darwin with an attack on him, Butler referred to William Paley's *Natural Theology* (1802) as 'that grand old book'.
20. F. Kluckhohn and F. L. Strodtbeck, *Variations in Value Orientations* (Evanston, Ill.: Roe, Peterson, 1961).
21. H. Frankfort, *The Birth of Civilization in the Near East* (New York: Doubleday Anchor Books, 1956) pp. 2–3.
22. Persons interested in this journal, or in contributing to it, are invited to write to NEXA at the address given in Ref. 3.

* * * * *

Editor's note: The attention of readers of this article is drawn to the article Science and the Fine Arts: Reflections of Platonic Idealism and of Aristotelian Naturalism by D. H. D. Roller [*Leonardo* **13,** 192 (1980)] and the document Contemporary Anthropocentrism: On Science and Traditional Cultures by P. Auger [*Leonardo* **13,** 223 (1980)].